



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/773,244	02/09/2004	Tomoyasu Aoshima	T2171.0214	7164
32172	7590	12/13/2005	EXAMINER	
DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP 1177 AVENUE OF THE AMERICAS (6TH AVENUE) 41 ST FL. NEW YORK, NY 10036-2714			CHEN, ERIC BRICE	
			ART UNIT	PAPER NUMBER
			1765	

DATE MAILED: 12/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/773,244

Applicant(s)

AOSHIMA, TOMOYASU

Examiner

Eric B. Chen

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 February 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4 is/are rejected.
- 7) ☒ Claim(s) 1 and 3 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 11/05; 9/05; 2/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 1 and 3 are objected to because of the following informalities: apparently "of a left" should be -- from the remaining -- (i.e., an etching mask made *from the remaining* region of said lamination layer). Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1 and 2 rejected under 35 U.S.C. 103(a) as being unpatentable over Kuroi et al. (U.S. Patent No. 5,956,600), in view of Wolf et al., *Silicon Processing for the VLSI Era*, Vol. 1, Lattice Press (1986).
4. As to claim 1, Kuroi discloses an etching method comprising the steps of: forming a silicon oxide film (2) on one principal surface of a silicon substrate (1) (column 5, lines 13-15), and then forming a silicon nitride film (3) on the silicon oxide film (column 5, lines 18-30), a thickness T_O of said silicon oxide film (300 Å, column 5, lines 16-17) and a thickness T_N of said silicon nitride film (100 Å, column 5, lines 19-21) being set to have a film thickness ratio T_O/T_N of 1.25 or larger; selectively etching a lamination layer

Art Unit: 1765

of said silicon oxide film and said silicon nitride film to form an etching mask made of a left region of said lamination layer (column 5, lines 22-28; Figures 1A-1B); and selectively (column 5, lines 26-28) and anisotropically etching (column 5, lines 30-33; Figure 1B) said silicon substrate (1) by using said etching mask (column 5, lines 28-30).

5. Kuroi does not expressly disclose use of an alkali etchant. Wolf teaches that orientation-dependent (or anisotropic) etchants are commonly used for wet etching silicon, including alkali etchants, such as KOH (pages 531-32). Wolf further teaches that wet etching is beneficial due to low cost, reliability, high throughput, and excellent selectivity with respect to mask and substrate materials (page 529). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use an alkali etchant. One who is skilled in the art would be motivated to use a conventional wet etchant, such as KOH, which has the benefits of low cost, reliability, high throughput, and excellent selectivity with respect to mask and substrate materials.

6. As to claim 2, Kuroi discloses that said film thickness ratio T_O/T_N is set in a range from 1.60 to 3.21 (column 5, lines 16-17, lines 19-21). Kuroi discloses a T_O of 300 Å (column 5, lines 16-17) and a T_N of 100 Å (column 5, lines 19-21) or a film thickness ratio T_O/T_N of 3.

Claim Rejections - 35 USC § 103

7. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Burns et al. (U.S. Patent No. 5,738,757), in view of Wolf.

Art Unit: 1765

8. As to claim 3, Burns discloses a wet etching method comprising the steps of: forming a silicon oxide film (12) on one principal surface of a silicon substrate (10), and forming a silicon nitride film (14) on the silicon oxide film (12) (column 6, lines 56-59; Figure 2A); selectively etching a lamination layer of said silicon oxide film (12) and said silicon nitride film (14) to form a mask opening through a partial region of said lamination layer and to form an etching mask made of a left region of said lamination layer (column 6, line 67; column 7, lines 1-3; Figure 2E); after or before said etching mask is formed, forming at least one film groove (Figure 2D, the right side of silicon nitride film (14) is removed) partially in said silicon nitride (14) (column 6, lines 61-63); and selectively and anisotropically etching said silicon substrate (10) with alkali etchant (column 5, lines 5-8) by using said etching mask (column 6, line 67; column 7, lines 1-3; Figure 2F). Wolf discloses that KOH is an orientation-dependent (or anisotropic) etchant (pages 531-32).

9. Burns does not expressly disclose that the groove is a stress relaxing groove, said film stress relaxing groove relaxing film stress applied to said mask opening. However, Wolf teaches that that nearly all thin films are in a state of internal stress, either compressive or tensile (pages 114-115). Stressed films either expand or contract parallel to the substrate surface (page 114). Because the silicon nitride film (14) is subjected to internal stresses, the groove would inherently function as a stress relaxing groove. Moreover, because the method of Burns is the same as the Applicant's claimed elements, the same results are expected, including relaxing film stress applied to said mask opening.

Claim Rejections - 35 USC § 103

10. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Burns, in view of Wolf, in further view of Streetman, *Solid State Electronic Devices*, Prentice Hall (1990).

11. As to claim 4, Burns does not expressly disclose that at least one film stress relaxing groove is formed surrounding said mask opening. However, Streetman teaches that semiconductor devices are batch fabricated and a plurality of identical features are built on a single wafer to keep the cost of each device fairly low (page 332). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form a plurality of groove, including grooves surrounding the mask opening. One who is skilled in the art would be motivated to reduce costs by batch fabrication of devices.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric B. Chen whose telephone number is (571) 272-2947. The examiner can normally be reached on Monday through Friday, 8AM to 4:30PM.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G. Norton can be reached on (571) 272-1465. The fax phone

Art Unit: 1765

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

EBC
Nov. 30, 2005


SHAMIM AHMED
PRIMARY EXAMINER
AU 1765